The Story of Geographical Discovery. By Joseph Jacobs. Pp. vi + 224. (London: George Newnes, Ltd., 1899.)

Mr. Jacobs has written a very readable little book. The historical aspect of geographical discovery is interestingly dealt with, and many subjects not usually included in books of geography are rightly given considerable prominence. The text is illustrated with twenty-four helpful maps, which serve to show the gradual increase of knowledge of our globe. The concluding table, showing the progress of geographical science from the time of Anaximander of Miletus down to the voyage of the *Challenger*, is most instructive. The author has collected his material with discrimination, and has evidently devoted much time and care to the preparation of his inspiring little volume. The recent marked development of imperial instincts should ensure the book the popularity it merits.

The Sphere of Science: a Study of the Nature and Method of Scientific Investigation. By F. S. Hoffman, Ph.D. Pp. viii + 268. (New York and London: G. P. Putnam's Sons, 1898.)

This book is the outcome of a series of lectures recently given by the author to his classes in Union College, to supplement their work in formal logic. Its object is to make clear what constitutes a science, and the grounds upon which every science must rest.

Very naturally, an important place is given to such considerations as the aims of science, what science takes for granted, the scientific method, and the limitations of science. Dr. Hoffman is always readable, and his style is pleasing. The book is by no means only a text-book; it will be found interesting by many educated readers, and should prove particularly useful in providing students of science with a knowledge of the groundwork of scientific investigation.

Chloroform: its Absolutely Safe Administration. By Robert Bell, M.D. Pp. 40. (Glasgow: R. L. Holmes, 1898.)

Dr. Bell states the results of over thirty years' experience in the administration of chloroform. He writes "as one having authority," since he has no death to record from the use of chloroform throughout this long practice. It is maintained that when properly administered, there is absolutely no danger attending the use of chloroform as an anaesthetic; and Dr. Bell gives a large amount of evidence in support of his contention.

A Middle Algebra. By William Briggs, M.A., and G. H. Bryan, Sc.D., F.R.S. Pp. vi + 354. (London: W. B. Clive.)

In this volume a knowledge of the more elementary properties of quadratic equations and progressions is assumed, and the requirements of candidates for the intermediate examinations for degrees at the University of London are especially borne in mind. Prof. Bryan's name is a guarantee for the accuracy of the book; and the arrangement, printing, and general appearance leave little to be desired.

Primer of Geometry. By James Sutherland, M.A. Pp. 117. (London: Longmans, Green, and Co., 1898.)

Many of the early propositions in Euclid's First Book are reduced to actual measurements in this volume, and are thus brought within the ready grasp of the mind of the average boy. The book really teaches the rudiments of geometry and mensuration upon Fröbelian principles. Where the exercises it contains can be carried out, some of them will prove of educational value; but others are misleading.

LETTERS TO THE EDITOR.

The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of Nature. *No notice is taken of anonymous communications.*]

Syrian Fishes with Abnormal Eyes.

Near the town of Hasbeya, Syria, arise springs which constitute in part the source of the small Hasbany river. In a short stream formed by those waters, I have found several varieties of abnormal-eyed fish, which, for convenience, may be grouped under five heads.

Fishes with (1) large protruding eyes; (2) an eye normal, and the other large and protruding; (3) half-protruding eyes; (4) two abnormal eyes unequal in size and development; (5) one eye normal, and the other rudimentary. At less than a hundred feet from the above-mentioned stream are two caves, but, strangely enough, only normal-eyed fishes could be found in the waters adjacent. The abnormal fishes are restricted to that stream, and are in the ratio of about one to four to the normal ones. The water is cold and tolerably clear, shallow near one bank and gradually deepening towards the other, to a depth not exceeding 7 feet in summer. No kingfishers or other fish-catchers were observed. Some of the fishes belonging to No. 1 had dark bodies and dark eyes, and seemed from their mode of motion to be little, if at all, sensible to light. Others belonging to No. 2 showed, by introducing a foreign object now near the normal eye and now near the abnormal one, that the latter saw less than the former. Dr. William van Dyck and Prof. A. E. Day, of the American College in Beirût, saw the fishes, and agreed that they had not met with any of the like during their study of the fauna of Syria. I may state that, having a small quantity of specimens, I would very willingly put it at the disposal of any specialist who may be interested in the question.

Saleem Makarius.

Al-Mokattam, Cairo, December 2.

Birds and Poisonous Fruit.

It is naturally difficult to obtain direct evidence as to how birds rid themselves of the indigestible parts of the fruit they eat. It is a question to which I have given some attention from its bearing on the dispersal of seeds. I have found large quantities of the seeds of hawthorn, dog-rose, mistletoe, and ivy evidently voided by birds, as I incline to think generally as fæces, especially in the case of the hawthorn and ivy. Some large bird, I suppose the rook, consumes ivy berries largely in the spring, and gets rid of the seeds in what appears to be a mass of excrementitious matter. Many of these have not lost their vitality, and germinate readily in the same season. I have some thriving ivy plants obtained from such seed sown in 1896, and numerous seedlings this year of similar origin, the seed being sown on April 28, and coming up on June 7. I do not think much stress need be laid on the fact that much of the fruit swallowed is voided undigested, though the mistle-seeds I found were in a mass something like a lump of frog-spawn, with much of the pulp of the berry still adhering to each seed. I fancy birds and beasts, like many human beings, frequently swallow greedily far more than is good for them, especially when they light upon an abundant supply after enforced abstinence. An observant farmer informs me that horses coming in hungry to the manger will, if allowed, swallow corn more rapidly than they can digest it, if the grains are supplied whole, and that a large proportion passes in a condition to germinate. For this reason he has it crushed before given to them. I could supply Mr. Bennett or Mr. Lowe with some other curious evidence on this question if they care to have it, and will send their address.

Bedford. E. M. Langley.

I can confirm Mr. Lowe's theory on this question.

For many years I have had robins coming to the hand for food in my garden. Before flying to the hand they constantly wait until they have succeeded in ejecting seeds from their crops. Great tits and blue tits also come to the hand, but never pause to eject anything. They are probably not large consumers of poisonous fruits.

I have on my lawn a large round china dish on an iron stand, in which many birds bathe, and from which they drink at all

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hours of the day. I often see the bottom of this dish sprinkled with seeds, evidently ejected by the birds. At present they are the seeds of the Laurustinus (*Viburnum Tinus*).

Rosehill, Falmouth, November 29. HOWARD FOX.

Periodic Tides.

THE letter of Mr. A. S. Thompson, in your issue of December 8, adds further interesting information as to secondary undulations, to that which I sent you in a paper printed in NATURE of February 3 last. This paper appears to have escaped Mr. Thompson's attention, as in it he will find that this subject was investigated on the Swiss Lakes by Duillier in the middle of the last century, and by Vaucher in 1804. They found that these undulations are common to all lakes at intervals of about twenty minutes. More recently the subject was taken up by Mr. Napier Denison on the Great Lakes in Canada, where he found oscillations of three to four inches at intervals of from fourteen to eighteen minutes; and by Mr. Bell Dawson during the tidal survey of the Gulf of St. Lawrence, where he found regular minor undulations occurring, in addition to those due to the tides. W. H. WHEELER.

December 10.

Cristatella Mucedo.

As this very beautiful polyzoon is generally believed to be nearly, if not quite extinct in ponds in the neighbourhood of London, I should like to record the fact that on November 19 last, I took a fine specimen two inches in length, which is still living. The colony was packed with statoblasts, most of which are now discharged. It was not perfect when taken, and has again divided since it has been in a small aquarium.

HENRY SCHERREN.

9 Cavendish Road, Harringay, N., December 3.

The Invention of the Gimbal.

WILL you or some of your readers kindly inform me, when and by whom the construction of the gimbal was contrived for the first time? KUMAGUSU MINAKATA.

7 Effie Road, Walham Green, S.W.

THE VALUE OF EXERCISE.[1]

THE value of exercise for the purpose of maintaining *mens sana in corpore sano* has been recognised from the remotest antiquity. Exercise, however, in its entirety seems to be divided into two sections which, though springing from the same cause, have led to different results: professional exercise or the training and maintaining of a body of athletes, and what may perhaps best receive the name of domestic exercise. The former appears to be one of the many instances of what was originally a means of becoming an end. Professional athletics doubtless took their origin in the use of exercise as a means; the perfect development of body and mind being the end. The huge muscles and small heads of professional athletes show us that the original means has finally become the end. This result from the point of view of the hygienist must be regarded as grotesque, and to the physician the professional athlete is neither more nor less interesting than the macrocephalic dwarf. The fainting and sickness of the over- or under-trained schoolboy, and the insomnia of the over-crammed student are essentially phenomena of the same class, and due to the same cause—viz. pathological plethora of some vascular areas, and pathological anæmia of others.

The use of exercise as a therapeutic agent, as also its use for the maintenance of health, falls under the second variety. The practice of exercises as part of one's toilette is very old. Any one conversant with the "heilgymnastik" (curative exercises) of the present day, let them belong to the systems of Ling, Schott, or Zander, cannot fail to be impressed with their resemblance to the devotional exercises of the devout Mahometan. Although doubtless the positions assumed by the worshipper are symbolical of passive submission, cringing obeisance, or subjected defiance, the point of interest to the physiologist is that after the performance of these devotions one experiences a distinct sense of fatigue. Thus by incorporating in his system of devotion actual muscular exercise the Prophet practically prescribed a system of "heilgymnastik," and forestalled the modern hygienic use of exercise. It would be interesting to know to what extent the exercise part of his devotions may be modified in the case of a Mohametan with *morbus cordis*. One fact, as will appear from the context, is worthy of notice. The devotional exercises are all performed slowly, and the change of posture is gradual. This is doubtless from a religious standpoint reverential, but from a physiological standpoint it prevents the occurrence of breathlessness or palpitation. In the one case which I had the opportunity of observing (devotion at sunset), the respirations were accelerated by four, the pulse by sixteen per minute by the devotions. This was in Algeria, near Hammam Rhira, at an altitude of 2000 feet. This effect might, no doubt, partially be due to psychical influences.

The modern therapeutic use of exercise is mainly directed to the attainment of two objects, local or general. The local use of exercises for the strengthening of certain groups of muscles mostly interests the surgeon or the neurologist. The ingenuity of Zander in inventing machines by which almost every group of muscles in the body can both be exercised, and made to do an exactly graduated amount of work, has done much to develope and systematise treatment in this branch of therapeutics. In the case of all muscles, including the heart, an optimal contraction is only obtained when the muscle contracts against an optimal resistance. This optimal resistance varies according to the condition of the muscle. In the case of the local use of exercise it is most important at the beginning of each set of exercises to find the optimal load. The great advantage of the mechanical system of resistance exercises, as compared with the manual method, is that once this optimal load is found it can be maintained constant, or as the condition of the muscle improves can be accurately increased. From this it follows that the work done on each occasion can be measured mathematically. It is impossible to achieve this by hand.

The second object aimed at by the therapeutic use of exercise is the one of most interest to the physician, viz. the production of a general systemic effect. This effect manifests itself chiefly upon the circulatory and respiratory systems. The sweating produced by exercise, although bringing into play the secretory function of the skin, and thus causing the excretion of certain noxious substances, as well as possibly the production and addition to the blood of an internal secretion, is essentially a circulatory phenomenon, and will not be further considered here, especially as exercise is, therapeutically, rarely pushed to such an extent as to produce sweating. One of the effects of exercise upon the respiratory system is known to every one, viz. breathlessness, or an increase in the depth and frequency of the respiratory movements. This dyspnœa varies according to the condition of the patient, and the amount or rather acuteness of the exercise. Physiologists are indebted to Zuntz and Geppert (*Pfluger's Archives*, xlii. p. 159) for having added most essentially to our knowledge of this condition. Before the work of these observers the dyspnœa attending exercise was held to be due to a diminution in the amount of oxygen and an increase in the amount of CO_2 in the blood; was, in short, regarded as an asphyxia. This hypothesis was based upon the experimental results of Mathieu and Urbain ("Du Gaz du Sang," *Archives de Phys.*, iv., 1871–72). Zuntz and Geppert, however, showed

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[1] "Respiratory Exercise in the Treatment of Disease." By Harry Campbell, M.D., B.S., F.R.C.P. Pp. viii + 200. (London: Baillière, Tindall, and Cox, 1898.)

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